AYK Region
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Pacific Herring Stocks and Fisheries in the Arctic-Yukon-Kuskokwim Region Northeastern Bering Sea, Alaska, 1987

A Report to the Alaska Board of Fisheries
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INTRODUCTION

The objectives of this report are to: (1) provide results from 1987 Pacific herring stock assessment programs, (2) review and evaluate 1987 harvests and management strategies for all Arctic, Yukon, and Kuskokwim (A-Y-K) commercial fishing districts in the northeastern Bering Sea and the Yukon-Kuskokwim River delta subsistence fishery, and (3) present management strategies for the 1988 A-Y-K Pacific herring fishing season. A-Y-K commercial fishing districts included in this report are: Security Cove, Goodnews Bay, Nelson Island, Nunivak Island, Cape Romanzof, Norton Sound, and Port Clarence.

The total A-Y-K Region herring harvest for 1987 was approximately 7,541 short tons (st) of Pacific herring with a total estimated value to the fishermen of approximately $4,957,000, of which $44,000 was food/bait and $4,913,000 was sac-roe. The only food/bait fishery in this region occurs during the sac-roe fishery when the roe content is below the processors' acceptable minimums. A very small portion of the harvest is sold in this manner. The food/bait sales totaled 614 st, while the sac roe harvest was 6,927 st.

Gill net fishing effort increased from 1986 levels in the Goodnews Bay (11%), Nelson Island (9%), Nunivak Island (28%), Cape Romanzof (38%), and Norton Sound (43%) Districts and decreased in the Security Cove District (6%). The Norton Sound District beach seine effort increased dramatically (82%) in 1987.

Average percent roe recovery from harvested Pacific herring ranged from 6.6 in Port Clarence District to 9.7 in Security Cove District (Table 2). Percent harvest of estimated Pacific herring

biomass ranged from 9.2 in Nunivak Island District to 18.6 in Cape Romanzof District.

Subsistence fishermen representing at least 184 families from 11 Yukon-Kuskokwim River delta villages harvested an estimated 155 st of Pacific herring (Table 5).

The 1987 total estimated Pacific herring spawning biomass of 57,300 st for the surveyed portion of the A-Y-K herring districts was approximately 3% higher than the 1986 estimate (Table 2). Ages 8 and 9 Pacific herring (1979 and 1978 year classes, respectively) comprised 44% of the total run; ages 10, 11, 12, and 13 comprised 15% of the return. Natural mortality of these older aged fish (9+) is believed to increase with each year of life. Younger age fish (ages 3, 4, and 5) accounted for 13% of the total biomass. This recruitment was largely contributed by an increase of these younger aged fish in the Norton Sound spawning population.

A regulatory action which affected A-Y-K herring fisheries during 1987 season was the readoption of superexclusive use area regulations by the Board of Fisheries. The superexclusive status for Goodnews Bay, Nelson Island, and Nunivak Island ended by regulation on 1 January 1987; however, the board during its April meeting reinstituted superexclusive registration for vessels and permit holders. Due to the early timing of western Alaska herring fisheries in 1987, the board used an emergency regulation to implement these regulations prior to opening of the fishery. The Norton Sound and Cape Romanzof herring fisheries are also designated as superexclusive use areas.

During the 1987 season, Pacific herring fishermen from a number of western Alaska communities requested information concerning the possibility of establishing limited entry in A-Y-K herring

fisheries. In response to this interest, Commercial Fisheries Entry Commission (CFEC) staff and commissioners visited a number of the fisheries during the commercial season. Petitions proposing limited entry were generated by local herring fishermen for the Nelson Island, Nunivak Island, Cape Romanzof, and Norton Sound Districts, and submitted to the CFEC. Public hearings were later held by CFEC during September in communities throughout western Alaska and other affected areas to obtain public comment concerning the proposal to establish limited entry in these districts. A decision was subsequently made by the state as a first step towards limited entry status for these fisheries to limit participation during the 1988 season in the Nelson Island, Cape Romanzof, and Norton Sound Districts to permit holders who had fished in these fisheries prior to 1 January 1987. During this period, CFEC will seek public input for establishing the final number of permits allowed in each fishery and the criterion to be used for determining which eligible permit holders will obtain a limited entry permit. A similar moratorium may be implemented for the Nunivak Island District which will limit participation in the 1988 season to permit holders who had fished in the Nunivak District prior to 1 January 1988.

SEASON SUMMARY

Stock status

Assessment Methods:

Aerial surveys were flown throughout the Pacific herring spawning season in all commercial fishing districts to determine relative abundance, distribution, and biomass of Pacific herring. Occurrence and extent of milt, numbers of fishing vessels, and visibility factors affecting survey quality were also recorded.

Data collection methods were similar to those used since 1978. A total of 116 hours was spent in aerial surveys: 17 hours in Security Cove and Goodnews Bay, 2 hours in the central Kuskokwim Bay area, 4 hours in Nelson Island, 6 hours in Nunivak Island, 2 hours in Cape Romanzof, 60 hours in Norton Sound, and 25 hours in Port Clarence. Weather and sea conditions were generally fair to good in the central Kuskokwim area, Nelson Island and Norton Sound. Unfavorable weather and turbid water hampered survey coverage much of the season in all other districts. Complete aerial survey biomass estimates were obtained only in Nunivak Island and Norton Sound Districts. Biomass estimates in other districts were obtained through utilization of partial district aerial survey biomass estimates, pre-season biomass projections based on prior year aerial surveys, and age class composition information.

Standard conversion factors of 1.52 (water depths of 16 ft (ft) or less), 2.58 (water depths between 16 and 26 ft) and 2.83 st/538 ft^2 (water depths greater than 26 ft) were used to convert estimated Pacific herring school surface areas to biomass within all districts.

Test fishing with variable mesh gill nets and sampling of commercial landings were conducted in all fishing districts (except test fishing in the Security Cove and Nunivak Island Districts) to determine age, size, and sexual maturity of Pacific herring and to note occurrence of other schooling fishes. Additionally, volunteer gill net vessels collected Pacific herring samples within the Security Cove, Goodnews Bay, Norton Sound, and Port Clarence Districts. This information was used during post-season analysis to interpret and modify aerial survey biomass data.

Ground surveys were conducted in some districts to obtain information on the distribution and density of kelp beds and Pacific herring spawn deposition.

Spawning populations:

Security Cove. A total of 20 aerial surveys was flown on 13 days during the 1987 season, from 26 April to 16 May. Herring schools were first observed in the district on 30 April (201 st). The largest biomass (2,285 st) was observed on 8 May under marginal survey conditions. No surveys were flown between 8-16 May due to strong onshore winds creating turbid waters and low cloud ceiling conditions. A survey on 16 May reported 1,927 st; the majority of fish was observed near Chagvan Bay. Test fishing was done for the most part by commercial fishermen who volunteered to sample. The procedure was to have volunteers call in and ask the Department where they should test fish. Permission was given to make short 5-10 minute sets with part of a shackle, and return the samples to the Department.

The Department also conducted some test fishing with a variable mesh sinking gill net, but only sampled for male-female ratios, and gonad maturity of females. Due to budget limitations, Department test fishing with variable mesh gill nets to determine the age and size composition of the population was not conducted in the Security Cove District during the 1987 season. Age composition data collected in the Goodnews Bay test fishing program was used to develop the 1988 outlook for Security Cove. Age composition for Goodnews Bay and Security Cove have been similar during past years.

A total of 336 Pacific herring was sampled from the commercial catch during 1-14 May. Ages 5, 6, and 7 Pacific herring comprised 25% and ages 8 and older Pacific herring represented 75% of the gill net catch (Figure 3). Age 4 Pacific herring were not observed in the catch. A total of 3.1 linear miles of milt was observed in 6 spawn sightings during aerial surveys. The majority of milt sightings was observed 6 May.

Goodnews Bay District. A total of 20 aerial surveys was flown on 13 days during the 1987 season, from 26 April - 16 May. The largest biomass (394 st) was observed on 3 May under poor survey conditions. All surveys were made under poor to unsatisfactory conditions due to turbid waters.

Test fishing was conducted from 29 April - 22 May. A total of 1,024 Pacific herring was sampled from these catches. A total of 360 Pacific herring was sampled from the commercial catch, 3-7 May. Volunteer commercial fishermen collected roe quality samples from designated areas of the Bay; industry roe technicians evaluated roe quality. Because the Togiak fishery was earlier than it has been during past years, industry vessels arrived in Goodnews Bay several days prior to the first opening, thus providing an opportunity for industry participation in pre-fishery beach parties.

A Pacific herring biomass estimate was not feasible during the season. The pre-season biomass projection of 2,000 st was used as a data base for management of the fishery. Approximately 72.6% of the total biomass was composed of age 8 and 9+ Pacific herring (Figure 3). Age 4 Pacific herring accounted for approximately 2.2% of the biomass. A total of 1.5 linear miles of milt was observed during aerial surveys. The majority of spawn was observed 6 May.

Central Kuskokwim Bay Area. The Department flew to Quinhagak on 16 June to test fish with variable mesh gill nets for herring at the request of local residents. A total of 4.5 hours was fished in four sets in which 10 herring, about 300 smelt, 4 chinook, 3 sockeye and 2 chum salmon and about 40 flounders were caught. It appeared that the herring abundance was too low to harvest adequate numbers for sampling.

A total of 2 hours was flown during three aerial surveys of the

Kipnuk area on 2-3 June with fair to good survey conditions. Two spawns were observed; peak spawn and biomass (1,225 st) were observed on 3 June.

In addition, a total of 294 herring was sampled from the Kipnuk area. The herring were provided by Kipnuk residents. The sample consisted of 60% females with 15% sexually immature, 80% sexually mature and 5% spent fish. Catch age composition was comprised of 5.3% age 6, 6.9% age 7, 28.9% age 8, and 59% age 9+ fish.

Nelson Island District. A total of 15 aerial surveys was flown on 14 days from 12 May-4 June during the 1987 season. Surveys were made under good to poor conditions. Turbid water conditions persisted for much of the season.

Test fishing was conducted from 16 May - 3 June. A total of 793 Pacific herring was sampled from these catches. The commercial catch was sampled during 23 - 24 May. A total of 600 Pacific herring was sampled from the harvest.

Additional sampling of the Nelson Island herring stock prior to the first commercial opening was conducted voluntarily by commercial fishermen in the district under the supervision of the Department of Fish and Game. The test fishing conducted by commercial fishermen was a new program for the Nelson Island District this year. Commercial fishermen were encouraged to participate. This portion of the test fish program began on May 16 and continued through May 23. Roe quality samples were analyzed onboard processing vessels by purchasing company technicians. The results were provided ADF&G, who included this information in their scheduled fleet radio broadcasts. Additional samples were brought in daily to the beach at Tooksook Village where roe percentages were estimated allowing the industry to follow the progression of roe maturity. These test fishing results showed a daily progression of roe maturity and

fishery development prior to the first commercial opening.

A peak season aerial survey biomass estimate of 8,100 st was made on 19 May. Ages 8 and older Pacific herring comprised 81.7% of the total biomass. Age 4 Pacific herring accounted for 1.2% of the biomass (Figure 3). A total of 3.8 linear miles of milt was observed in four spawn sightings during aerial surveys. The majority of spawn was observed 4 June.

Nunivak Island District. A total of nine aerial surveys was flown on 9 days during the 1987 season. Most surveys were made under fair to poor conditions.

No Department test fishing was conducted within the Nunivak Island District. Age composition data collected for the Nelson Island District was used to develop a biomass outlook for Nunivak Island for 1988. Age composition for these districts has been similar during past years. The commercial catch was sampled during 13-26 May. A total of 600 Pacific herring was sampled from this harvest.

Test fishing was conducted by volunteer members of the Nunivak Island fishing fleet from 15 May through 20 May with estimated roe recovery ranging from 1.7% to 15.0%. Peak roe recovery for 3 inch mesh gear occurred on 16 May, and for 2.75 inch gear on 19 May. A total of 8 fishermen made 56 gill net sets and captured approximately 1,154 herring in 14.95 hours of test fishing.

A peak in-season Pacific herring aerial survey biomass estimate of 1,326 st was made on 19 May under marginal survey conditions. A total of 42 linear miles of milt was observed in 58 sightings during aerial surveys. The majority of spawn was documented 12 May.

Cape Romanzof District. Aerial surveys were flown during the 1987 season on 19 and 24 May. During both surveys turbid water prevailed within Kokechik Bay hindering survey effort, however, on 24 May weather conditions allowed for a fair survey of Kokechik Bay adjacent to Cape Romanzof, and Scammon Bay.

Test fishing was conducted during 15 May - 3 June. A total of 868 Pacific herring was sampled from these catches. Pacific herring comprised approximately 96% of the total catch of schooling species. The commercial harvest was sampled 29-31 May. A total of 410 Pacific herring was sampled from this harvest.

The in-season Pacific herring spawning biomass, based on the 24 May aerial survey was 6,100 st. Analysis of data from aerial surveys, spawn deposition surveys, test fishing and commercial harvests resulted in a post-season Pacific herring biomass estimate of 7,200 st. Approximately 63% of the total biomass was composed of ages 8 and older Pacific herring. Age 5 Pacific herring accounted for 7%, age 6 accounted for 12%, and age 7 accounted for 18% of the biomass. Newly recruited age 4 Pacific herring represented less than 1% of the total observed spawning biomass.

Ground surveys indicated primary spawn deposition occurred from 20 May - 4 June, of longer duration than most previous years. No single day's spawn was of exceptional magnitude, however deposition occurred on each tide and was well distributed throughout the district. Due to the extended duration of spawning, it was difficult to evaluate overall spawn intensity due to desiccation, erosion, and predation of eggs. On 26 May, 4 inches of snow covered Pacific herring spawning areas causing high egg mortality.

Norton Sound District. A total of 19 aerial surveys was flown on 18 individual days during the season from 16 May - 12 June. Most

surveys were made under fair survey conditions. The peak in-season biomass of 17,150 st was attained by adding the 4 June estimates in subdistricts 1, 2, and 3 (Table 5). Overall survey conditions during these surveys were fair to poor. However, a survey flown on 8 June under fair conditions observed 28,383 st. The post-season peak biomass was attained by adding the total harvest to date (3,953 st) and the ADF&G test fish (34 st) to the peak observed biomass (28,383 st) to obtain an estimated peak biomass of 32,370 st.

Based on aerial surveys and age class composition data from 1986, it was projected that 20,000 st would be on the grounds during the season. The actual biomass was much higher than forecasted, with indications of a stronger recruitment of young fish than expected.

Two Department field crews were operational during the 1987 season. One crew operated from Cape Denbigh. The second crew was a "mobile" crew, operating from Unalakleet, Golsovia, Cape Denbigh, and finally, St. Michael Bay, as changing ice conditions and test fishery needs arose.

Additional evaluations were conducted by the Department in conjunction with a chartered seine vessel to determine point estimates for schools of herring in Norton Sound. The purpose of this research was to continue to refine Norton Sound biomass estimates by providing school surface area to tonnage conversions. Historically, surface area to tonnage conversions derived from studies conducted in the Togiak herring fishery have been used. Herring captured during these studies were sold to a company whose name came up on a random draw. A total of three successful seine captures was made; one on 31 May and two on 5 June. The herring caught on 31 May were released because they were totally green, unmarketable fish. Both sets made on 5 June contained marketable herring; 34.4 st at 8.8% roe recovery were

sold with the proceeds going back into the state of Alaska test fish fund. The observed estimate by surface area agreed closely with the actual weights of the schools which were weighed and sold.

Test fishing with variable mesh gill nets was conducted from 21 May - 11 June. A total of 931 Pacific herring was sampled from these catches. A total of 161 Pacific herring was sampled from the purse seine catches. The commercial catch was sampled 7-8 June. A total of 3,759 and 323 Pacific herring was sampled from gill net and beach seine catches, respectively. Approximately 52.3% of the total biomass was composed of age 5, 6 and 7-year-old fish while ages 8 and older herring composed 44.4% of the available biomass. Newly recruited age 4 Pacific herring represented about 2% of the total spawning biomass.

Spawning activity was observed from 5-12 June with peak spawning activity occurring 8 June. A total of approximately 37 linear miles of milt was observed in 118 sightings. Spawning occurred primarily in St. Michaels and Cape Denbigh Subdistricts.

Port Clarence. A total of 8 aerial surveys was flown on 8 days during the 1987 season, from 13-26 June. The largest biomass (932 st) was observed on 19 June under poor survey conditions.

Only one spawn was sighted during the 1987 season. The spawn was sighted in a shallow saltwater inlet near Jones Point at the base of the Cape Spencer Peninsula. Local residents report spawning in similar areas near Teller and Bervig Mission. The spawning substrate in these areas is thought to be grass and other filamentous plants. A local fisherman brought in a sample of detritus caught in his net in Grantley Harbor that had light spawn on it. The sample was a mixed bundle of submarine grass, fucus kelp, and filamentous seaweed.

Aerial surveys are very difficult in the Port Clarence District due to organic coloring of the waters of Imuruk Basin, Tuksuk Channel, Grantley Harbor and to a lesser extent Port Clarence. Only one successful survey of Grantley Harbor was made, and that was under poor conditions due to water color. Port Clarence cleared once the ice melted, and wind and sea currents purged it of stained water.

The Port Clarence District is small in comparison with the Norton Sound District. An overwintering Pacific herring population is thought to inhabit Grantley Harbor and Imuruk Basin, although the size of the fish captured in the Port Clarence fishery seems similar to those in Norton Sound. Although, due to budget limitations, no department test fishing could be conducted in Port Clarence, 210 scale samples obtained from purse seine catches were evaluated. Approximately 26% of the population samples were ages 8 and older. Age 4 recruitment represented 3% of the population, and 71% of the sample were ages 5, 6, and 7 Pacific herring.

SUBSISTENCE FISHERY

Subsistence fishing for Pacific herring in the northeastern Bering Sea is very important in villages of the Yukon-Kuskokwim River delta. Subsistence harvest surveys have been conducted annually in Yukon delta villages and sporadically in Kuskokwim delta villages since 1975. Average annual Pacific herring subsistence harvests have been at least 110 st since 1975 (Table 4). During 1987, the Pacific herring subsistence survey resulted in an estimated 155 st of subsistence herring harvested by at least 184 fishing families. Residents of Nelson Island villages accounted for about 80% of the reported harvest while other

Kuskokwim River delta and Etolin Strait communities accounted for about 18% of the harvest. Residents of Yukon River delta villages harvested about 3 st of Pacific herring accounting for about 2% of the estimated total harvest. Although subsistence survey results are believed to accurately reflect harvest trends, reported catches represent minimum figures since all fishermen could not be contacted and surveys were not allowed to be conducted by Kuskokwim River delta village councils in Kongiganak and Kwigillingok.

COMMERCIAL FISHERY

Security Cove District. The commercial Pacific herring fishing in the Security Cove District has been regulated by emergency order since 1981 to provide for an orderly fishery and periodic reassessments of herring biomass. Three fishing periods were allowed for a total fishing time of 13 hours (Table 5). Total harvest was 313 st (Table 2). The peak catch day occurred 14 May when approximately 312 st was harvested by 59 fishermen.

The first opening was a 6-hour test opening on 2 May. An aerial survey on 1 May reported 670 st of herring in the district. An estimated 15 boats fished, but few herring were harvested and none sold.

The second 3-hour opening was held on 10 May. An aerial survey on 8 May reported 2,400 st of herring in the Security Cove District, and test fishing on 9 May found schools of ripe fish. There were from 100 to 120 gill-netters on the grounds, but only 2 st (7 deliveries) of herring were taken. The average roe recovery was about 9.8%. Many fishermen found only small amounts of spawned-out fish, but a few found schools of ripe fish.

The third opening which was held on 14 May provided 4 hours of fishing. Because of the strong northwest winds and turbid water

conditions, no aerial surveys were conducted from 8 May to 16 May, but test fishing on 13 May and 14 May indicated schools of ripe fish in the district. High onshore winds and rough seas hampered fishing during the opening. Fifty-nine boats fished with a total of 313 st of herring sold. Roe recoveries averaged around 9.7%.

Nearly all of the 1987 season harvest was sold for sac roe with only a small portion (<1 st) sold as food or bait. Average sac roe recovery for the season was 9.7%. No wastage of Pacific herring was documented. Value of harvested Pacific herring was estimated to be about $0.24 million. Average price was $800 per st for 10% roe recovery, with an increase or decrease of $80 per st for each percentage point above or below 10%. Average price paid for the food or bait catch was $250 per st.

Eight processors, three less than in 1986, purchased Pacific herring (Table 3). A total of 65 fishermen participated in the 1987 fishery. This was a 6% decrease in fishermen from 1986. Area residents (i.e. fishermen living in Platinum, Goodnews Bay, Quinhagak, and Bethel) did not make landings in the Security Cove herring fishery during the 1987 season.

The overall commercial exploitation rate of Pacific herring was 13.4% of the estimated available biomass (Table 2). Ages 8 and older Pacific herring comprised approximately 74.9% of the total harvest (Figure 3). Age 4 Pacific herring were not documented to be present in the harvest.

The Fish and Wildlife Protection vessel TROOPER was on patrol in the Security Cove District during the season. No major fishing violations were documented.

Goodnews Bay District. Commercial Pacific herring fishing in Goodnews Bay has been regulated by emergency order since 1981 to

provide for an orderly fishery and periodic reassessments of herring biomass. The commercial herring season opened with a 6-hour test opening on 3 May 1987. Seven tenders representing four companies were on the grounds. Quality and quantity of the commercial catch were poor as an estimated 75 fishermen caught 33.5 short tons of herring of which 27.1 tons were purchased as bait (Tables 3 and 5).

Between 4 May and 7 May, beach meetings with fishermen were held to monitor the quality of the herring in Goodnews Bay. Samples were brought in by volunteer fishermen and analyzed by industry roe technicians. Roe quality improved between 4-7 May. A second and final 5-hour commercial opening was announced on 7 May. Ninety-three fishermen caught 287.3 tons of herring during the second opening in goodnews Bay. Six tenders representing 4 companies purchased fish.

Sac roe herring accounted for 56% (179 st) of the harvest. Wastage of Pacific herring was not a problem. Average roe recovery for the season was 7.3%. Value of harvested Pacific herring to fishermen was estimated to be approximately $0.13 million (Table 2). Average price was $600 per st for 10% roe recovery, with an increase or decrease of $60 per st for every percentage point above or below 10%. Four processors purchased Pacific herring (Table 3). Most processors established 7% as the minimum roe recovery required for Pacific herring to be purchased for sac roe. Pacific herring of less than 7% roe recovery were purchased for food or bait and the price averaged $50 per st. A total of 117 fishermen participated in the 1987 fishery, an 11% increase in fishermen from 1986. Local fishermen (i.e. residents of Platinum, and Goodnews Bay, and Quinhagak) accounted for 33% of the effort and about 17% of the harvest.

Overall exploitation rate of Pacific herring was 16.0% of estimated available biomass (Table 2). Ages 8 and older Pacific

herring comprised 95.1% of the total harvest, (Figure 3). Age 4 Pacific herring were not documented in the harvest.

Management of the 1987 commercial Pacific herring fishery was without major problems. The Fish and Wildlife Protection vessel TROOPER patrolled the Goodnews Bay District during the season. No major fishing violations were documented.

Nelson Island District. The commercial harvest of Pacific herring was initiated in the Nelson Island District in 1985 season. Since that time, the commercial fishery has been regulated by emergency order to provide for an adequate subsistence harvest, an orderly commercial fishery, and to allow for periodic reassessments of the herring biomass. Two commercial fishing periods were allowed from 23 - 24 May for a total fishing time of 6 hours (Table 5). A total of 923 st of Pacific herring was harvested during the commercial fishery. The peak catch day was 24 May when 685 st were harvested by 229 fishermen.

Sac roe herring accounted for 99% (915 st) of the harvest. Average sac roe recovery was 9.2%. Wastage of Pacific herring was not a problem. Value of the commercial herring harvest to the fishermen was estimated to be approximately $0.66 million. Average price was $800 per st for 10% roe recovery, with an increase or decrease of $80 per st for each percentage point above or below 10%. The average price per st paid for food or bait herring was $50. Nine processors operated in the Nelson Island District. A total of 235 fishermen participated in the fishery. This represents a 31% increase over 1986 effort levels in the fishery. Area fishermen (residents of northern Kuskokwim Bay and Etolin Strait villages) accounted for 59% of the fishing effort and 48% of the harvest.

Overall commercial exploitation rate of Pacific herring was

11.4%. Ages 8 and older Pacific herring comprised 89.4% of the total harvest (Figure 3). Age 4 Pacific herring were not documented to be present in the harvest.

The Traditional Councils of each village on Nelson Island, United Villages of Nelson Island, and Qaluyaat Herring Association all requested that the waters of the Nelson Island District between Atrnak Point and Talurarevuk Point, and the waters between the southern and northern edges of Chinit Point be closed by emergency order to prevent interference with the subsistence fishery. These waters were closed for the entire commercial fishing season since the Board of Fisheries policy statement of management of the Nelson Island District herring fishery indicated that such a closure was appropriate. The closure appeared to have no effect on the commercial fishery since the harvest guideline was easily taken and roe quality was good.

The Fish and Wildlife Protection vessel TROOPER patrolled the Nelson Island District during the season. Several citations were issued for fishing after the closure and one citation was given for violating the superexclusive registration regulation.

Nunivak Island District. As in the Nelson Island District, the initial commercial fishery for Pacific herring in the Nunivak Island District was held during the 1985 season. During 1987, the fishery was regulated by emergency order to provide for an orderly fishery and to allow for periodic reassessments of Pacific herring biomass. Seven commercial fishing periods were allowed from 13-26 May for a total fishing time of 39 hours (Table 5). A total of 414 st of Pacific herring was harvested during the commercial fishery. The peak catch day was 24 May when 220 st were harvested by 47 fishermen.

Commercial fishing opened on 13 May with a 2-hour test period. Fishermen were cautioned to set only part of their gear and check

the quality or maturity of the roe before deploying all of their gear. The local fleet, however, made 39 deliveries totaling 49.9 st for food/bait herring with an estimated roe recovery of 4.0%. Subsequently, a test fishing program with participation from the commercial fishing fleet was established. Aerial survey biomass estimates peaked on 18 May. By 20 May test fishing results improved and the fishery was reopened on 21 May for 4 hours; however, weather conditions prohibited fishing.

On 22 May, a 4-hour opening resulted in the harvest of 1.8 st of sac roe herring from 8 deliveries with an estimated roe recovery of 10.2%. The small volume of herring taken during this opening was primarily due to poor weather conditions, with high winds and rough seas severely restricting fishing effort. The fishery was opened for 4 hours on 23 May, resulting in a harvest of 18.3 st of herring from 19 deliveries with an estimated roe recovery of 7.3%.

A 5-hour commercial opening was announced on 24 May. Three hours into the period, projected harvest was estimated to be 80 st. Consequently, the period was extended an additional 13 hours allowing a second flood tide to be exploited during the period. However, inclement weather reduced fishing effort during the final 6 hours of the opening. The reported harvest at the close of the period was 162.7 st of herring from 173 deliveries with an estimated roe recovery of 8.3%.

The fishery reopened the evening of 25 May for 3 hours. Again, weather reduced effort to 11 deliveries and 34.7 st of herring with 6.9% roe recovery. On 26 May, a 3-hour opening produced 36.5 st of herring from 33 deliveries at 6.2% roe recovery. The remaining tenders and processors in the Nelson/Nunivak Islands District departed the grounds for Norton Sound by 27 May.

Average sac roe recovery for the season was 7.8%. No wastage of

Pacific herring was documented. Value of harvest to fishermen was estimated to be approximately $0.2 million. Average price was $800 per st for 10% roe recovery, with an increase or decrease of $80 per st for every percentage point above or below 10%. Pacific herring of less than 7% roe recovery were purchased for food or bait herring for the average price of $50 per st. Four processors purchased herring in the Nunivak Island District. A total of 61 fishermen participated in the fishery. Resident fishermen from Merkoryuk (37) accounted for 59% of the effort and were responsible for 71% of the harvest.

The overall commercial exploitation rate of Pacific herring was 9.2% of the estimated available biomass (Table 2). Ages 8 and older Pacific herring accounted for approximately 90% of the commercial harvest (Figure 4). Age 4 Pacific herring were not documented to be present in the commercial harvest.

Management of the 1987 commercial Pacific herring fishery was without major problems. The Fish and Wildlife Protection vessel TROOPER patrolled the Nunivak Island District during the season. No major fishing violations were documented.

Cape Romanzof District. Commercial Pacific herring fishing periods were established by emergency order during 29-31 May for a total fishing time of 8 hours (Table 5). The second largest harvest of 1,342 st was made during the shortest ever fishing season by 157 fishermen (Table 2). The entire harvest was taken from Kokechik Bay.

Over 98% of the harvest was taken as sac roe. Average roe recovery was 8.9%, Wastage of Pacific herring was not a problem although some gill nets were abandoned at the close of the season.

Estimated value of the total harvest to fishermen was $1.0

million. Average price for sac roe Pacific herring was $835 per st at 10% roe recovery - $55 a percentage point. Average price for bait quality Pacific herring (less than 7% roe recovery) was $125 per short ton. Several companies classified bait quality Pacific herring as being less than 6% sac roe recovery; however, no bait sales were made under this classification. Nine processors purchased herring in the Cape Romanzof District, four more than during 1985 (Table 3). Fishing effort was at an all time record with Alaska resident fishermen accounting for 87% of the effort and 70% of the harvest. Local fishermen (residents of Chevak, Hooper Bay, and Scammon Bay) accounted for 53% of the effort and 33% of the harvest.

The overall exploitation rate of Pacific herring was estimated to be 18.6% of the available biomass. Age composition information indicated ages 8 and older Pacific herring comprised approximately 76% of the total harvest. Ages 4 and 5 Pacific herring were not observed in the catch.

Fishing effort and processor/tender support was 62% and 80% above that of 1986, respectively, which resulted in increased fleet efficiency resulting in significant decrease in commercial fishing time from prior years. Catch efficiency was significantly increased by non-local fishing vessels using power rollers and shakers. Fishing periods 75-85% shorter in duration than during previous years resulted in gill nets being left in the water on period closures, primarily after the first two periods.

Four Fish and Wildlife Protection (FWP) officers were present on the Cape Romanzof District fishing grounds during he 1987 Pacific herring commercial fishing season. These officers were supported by the Protection Vessel TROOPER, 2 skiffs, and a Super Cub fixed-wing aircraft. In total, 74 commercial fishing citations were issued. The citations were issued for fishing during closed

periods (57), violation of superexclusive use regulations (9), failure to have crewmember licenses (3), failure to display vessel numbers (4), and failure to submit fish tickets prior to departing district (1). This was the first season FWP participated in the cape Romanzof District commercial fishery.

Norton Sound District. The 1987 Norton Sound herring season was closed by emergency order on the regulatory opening date of 15 May to prevent the harvest of unmarketable herring. The first commercial delivery was made on 7 June. The entire district was closed on 8 June with a harvest of 4,082 st of herring. Since 1980, catches have averaged 3,950 st.

There were approximately 564 fishermen who made at least one delivery. This is the highest effort on record since a large scale domestic fishery began in 1980. Fishing effort during the period from 1980 to 1986 averaged 276 fishermen, with a range of 194 (in 1984) to 332 (in 1981). This season's effort was thus more than twice the average effort from 1980 to 1986. The total number of fishing vessels that participated was at least 358 as counted during the 7 June gill net opening, and may have been as high as 475 as indicated by computer summary of ADF&G numbers off fish ticket deliveries.

During the 1987 season, 559 fishermen used gill nets landing a total of 3,759.s st; 22 fishermen participated in the beach seine fishery landing 323.3 st of herring (Table 2). The beach seine openings were conducted during separate times from the gill net openings to prevent gear conflicts.

There were 12 companies present on the grounds to purchase herring. These companies were represented by 71 vessels which served as tenders or processing vessels (Table 3). This is the largest commercial fleet that has ever participated in the Norton Sound herring fishery.

A projected biomass of 20,000 st was expected to return this season. This projected return was based upon the 1986 post-season escapement estimates using mean rates of natural mortality and growth and expected age class composition of the return. If aerial survey observations and age class composition data indicated a return of 20,000 st, then 20% or 4,000 st (3,600 st by gill net) 400 st by beach seine could be harvested.

On 5 June, Department aerial surveyors began observing spawning activity and an increase in biomass in the St. Michael Subdistrict. On 6 June, a "beach party" was organized at "Camp Cove" on cape Denbigh, the same site as the 1986 beach parties. Test fish samples from Subdistricts 1, 2, and 3 were obtained and delivered to Camp Cove for industry examination. Also, on 6 June Department observers documented massive spawning activity on the kelp beds of the St. Michael Subdistrict, including south Stuart Island.

On the evening of 6 June, two emergency order announcements were made. The first opened subdistricts 1, 2, and 3 to 6 hours of gill net fishing on 7 June; the second opened Subdistricts 1, 2, and 3 to 3 hours of beach seine fishing on 7 June.

The total reported gill net harvest following the closure on 7 June was 2,918 st; the total reported beach seine harvest following the closure was approximately 192 st. With a total reported harvest by both gear types of approximately 3,000 st, a harvest of approximately 1,000 st by both gear types could be allowed. Later on 7 June, an emergency order announcement was made to reopen Subdistricts 1, 2, and 3 to the gill net fishermen for 1 additional hour.

Verbal catch reports the morning of 8 June indicated an additional harvest by gill-netters of 700 st following the 1-hour

opening. The total reported gill net harvest of 3,632 st combined with the total reported beach seine harvest of 192 st indicated a total harvest to date of 3,824 st or 19.1% of the projected biomass. With approximately 200 st left to fill the guideline harvest, a 2-hour opening for the beach seine fishery was announced. This second beach seine opening was restricted to Subdistricts 2 and 3 because of the probability of spawned out fish in Subdistrict 1. The reported harvest following the second beach seine opening was 155 st, bringing the total in-season reported harvest by this gear type to 347 st. The total verbal in-season harvest including the 34 st harvested during Department point estimate testing equaled 4013 st. Final harvest totals based on fish tickets increased the 1987 harvest to 4082 st.

The average sac roe recovery was 8.6%, with an average grounds price of $806.00 paid per short ton of 10% roe herring. Of the 408.2 st harvested, 303 st were purchased as bait herring (<6% roe quality) for which fishermen received an average of $93.00 per ton. The total value of the herring harvest to the fishermen was approximately $2.6 million. This is the second highest dollar value in the history of this fishery (Table 2). The average fisherman earned just $4,640.00, which is considerably less than the average earnings in 1986 of $8,980.00.

The estimated in-season district biomass was 17,150 st (observed). Due to poor survey conditions prior to the fishery, it was impossible to sight the projected return of 20,000 st. Variable mesh catches indicated the presence of all age class herring with a stronger than expected showing of age 5 recruit herring. Thus, the commercial fishery was managed assuming a biomass of at least 20,000 st present on the grounds. An aerial survey flown under fair conditions on 8 June, (the day after the commercial gill net herring openings and 1 beach seine opening), during the second beach seine opening, observed a biomass of 28,383 st. Adding the commercial and ADF&G test fish harvests

prior to 8 June brought the peak estimated biomass for the 1987 season to 32,370 st. The commercial harvest of 4,082 st represented an exploitation rate of 20.4% and 12.6% of the in-season and post-season biomass estimates, respectively. The fishery was not reopened after the 8 June biomass sightings due to the high probability of spawned-out fish present following two days of extensive spawning activity. Ages 5 and 6 herring comprised 28.8% of the total harvest; ages 8 and older fish represented 53.2% of the catch for all gear types. Age 4 herring accounted for less than 1% of the harvest.

Ice conditions posed some problems during the fishery. A few shackles of gear were abandoned in St. Michael Bay during the first (6-hour) gill net opening because of moving ice. The loose ice moving northward during the second (1-hour) gill net opening chased fishermen out of the Shaktoolik and south side of Cape Denbigh area; again, a few shackles of gear were abandoned as the ice moved rapidly onto the fishing grounds.

Protection efforts in Norton Sound consisted of two Boston Whalers and two single engine aircraft (one equipped with floats). Personnel consisted of four permanent, full-time Fish and Wildlife Protection officers.

Fish and Wildlife Protection officers patrolled the fishing grounds during each opening and closure. Good compliance with fishery closure times occurred; only 2 citations were issued for this violation. Other reported violations included: no crewmember license (2), removed vessel numbers (4), and failure to turn in fish tickets prior to departing the district (1). In addition, 24 citations of violation of the superexclusive use area status of Norton Sound were made. A total of 17.9 st of herring was confiscated by the state of Alaska during the 1987 season.

Port Clarence District. The Port Clarence commercial herring fishery has been in regulation since 1982. The season opens by regulation on 15 April and closes by regulation on 15 November. On 13 June, an emergency order was written restricting purse seiners to four 2-hour openings each day. Continuous gill net fishing was also opened at this time.

Three purse seine vessels arrived at the fishing district near Point Spencer on 15 June. Ice conditions prevented the seiners from entering Port Clarence until 17 June. The seiners were prospecting all open water areas using jigging lines from boats and a float plane as well as some conservative seine sets from 15 June until they left the district. On 18 June, when the fishery closure for 19 June was announced, the seiners began catching and selling herring. The seiners catches diminished with each successive opening. The seine harvest was reported to be 138.5 st at the June 19 closure.

On 20 June, a single local gill net fisherman made an overnight set in Grantley Harbor and caught an estimated 1,500 lbs of bait quality herring. He was unable to sell these fish to the tenders; he sold only 200 lbs as dog food at $.30 per pound. The remainder was largely wasted, however a small amount was distributed to subsistence users.

By 30 June, 145.5 st of herring had been harvested with an average roe percent of 6.6%. The Port Clarence seine catches were sold for $800/st at 10% roe. The total commercial catch was valued at $77,466. The harvest represents the only large scale commercial sale of herring in this district.

The seiners and all three tenders departed the Port Clarence District during the afternoon of 19 June. Because there was still 20 st of the guideline harvest left unfilled and only one or two local gill-netters were left in the area, the season was

reopened at noon on 22 June. The local gill net fishermen have not been able to find a market since the departure of the tenders and the season remains open.

OUTLOOK AND MANAGEMENT STRATEGY FOR 1988

Based upon apparent weak recruitment of younger age classes (ages 4-7) and reduced returns of the abundant 1977 and 1978 year classes (ages 9 and 8 Pacific herring respectively), due to high natural mortality of older aged herring a decline in the harvestable surplus of Pacific herring available in all districts during 1988 with the exception of Norton Sound is expected. However, since methods to reliably forecast actual returns are still being developed, and reliable estimates of recruitment are not available, harvest levels will be adjusted during the season according to observed Pacific herring spawning biomass. If it is not possible to determine Pacific herring abundance using aerial survey methods, stock abundance will be assessed using information from test and commercial catches along with spawn deposition observations.

Projections from post-season escapement estimates, using mean rates of natural mortality and growth for each age class, indicate that the 1988 minimal spawning biomass for the northeastern Bering Sea Pacific herring stocks (Security Cove to Norton Sound) should be approximately 38,600 st (Table 6). However, increased recruitment of ages 3 through 5-year-old Pacific herring could increase this figure. (NOTE - use all projection estimates with extreme caution as projection method is in developmental stage and data base is not extensive.)

Of concern is that all available data indicates the occurrence of a continuing downward trend in the Pacific herring spawning biomass for all districts with the exception of Norton Sound due

to the lack of any significant recruitment of younger age fish into the population beyond the 1978 year class. Factors responsible for this decline have not been identified as the scope of investigation is beyond the resources presently available to conduct necessary research activities. Continuation of this declining biomass trend may precipitate reduced harvest levels or complete closures of selected commercial fishing districts beginning with the 1988 Pacific herring commercial fishing season. Some districts will be considering reduced exploitation rates during 1988.

Security Cove District. Emergency order authority will be used to adjust the occurrence and length of fishing periods to stock strength, fishing effort, and spawning activity. No fishing will be allowed until total biomass reaches 1,200 st. The Security Cove Pacific herring stock will be harvested at a 10% or less exploitation rate in response to the declining recruitment of younger age fish into the population. If in-season surveys indicate a biomass well in excess of the 1988 projection, up to a 20% exploitation rate may be used. The 1988 projected return is 1,500 st which at a 10% exploitation rate would result in a harvest of about 150 st.

Goodnews Bay District. Management strategy for this district will be similar to that used for Security Cove. The season will opened by emergency order. A minimum biomass of 1,200 st will be required on the grounds prior to the first opening. The harvest level will be maintained at 10% or less unless available biomass is in excess of the 1988 projection and then a higher exploitation rate may be used. The 1988 projected return is 1,300 st which at a 10% exploitation rate would result in a harvest of 130 st.

Nelson Island District. As in 1987, the Nelson Island commercial fishery will be regulated through the use of emergency order

authority. To provide additional protection for the subsistence Pacific herring harvest the following guidelines will be followed:

1. The commercial fishery will be allowed to take up to 10% of the herring biomass, compared to up to 20% for most other fisheries having stocks of similar size and condition.

2. The commercial fishing season will be opened when a biomass of 2,500 st or spawning activity is documented.

3. Periodic closures of the commercial fishery will be scheduled, during which time subsistence fishing will be the only activity allowed.

4. Several important subsistence use areas occur throughout the district, including the waters north of Cape Vancouver, and specific areas may be closed to commercial fishing to insure the adequacy of subsistence harvests.

5. The Department will by all available means, including input from local residents, insure the adequacy of subsistence herring harvests during the commercial fishing season.

The spawning biomass projected to return to the Nelson Island District during 1988 is 5,000 st which at a 10% exploitation rate would result in a harvest of 500 st.

Nunivak Island District As in 1987, the Nunivak Island District commercial herring fishery will be regulated by emergency order authority. No commercial fishery will be allowed until the total biomass reaches 1,500 st or spawning is observed. Commercial

Table 1. Pacific herring harvests by domestic commercial fishermen in the Northeastern Bering Sea, Alaska, 1909 -

Year	Herring (st) 1/								Spawn on Kelp (st)	
	Security Cove	Goodnews Bay	Nelson Island	Nunivak Island	Cape Romanzof	Norton Sound	Port Clarence	Total Sac Roe	Norton Sound	Total Harvest
1909-1916	-	-	-	-	-	- 2/	-	-	-	-
1916-1928	-	-	-	-	-	1,881	-	1,881	-	1,881
1929	-	-	-	-	-	166	-	166	-	166
1930	-	-	-	-	-	441	-	441	-	441
1931	-	-	-	-	-	86	-	86	-	86
1932	-	-	-	-	-	529	-	529	-	529
1933	-	-	-	-	-	31	-	31	-	31
1934	-	-	-	-	-	4	-	4	-	4
1935	-	-	-	-	-	15	-	15	-	15
1936	-	-	-	-	-	-	-	-	-	-
1937	-	-	-	-	-	6	-	6	-	6
1938	-	-	-	-	-	10	-	10	-	10
1939	-	-	-	-	-	6	-	6	-	6
1940	-	-	-	-	-	14	-	14	-	14
1941	-	-	-	-	-	3	-	3	-	3
1942-1944	-	-	-	-	-	-	-	-	-	-
1945	-	-	-	-	-	-	-	-	-	-
1946	-	-	-	-	-	-	-	-	-	-
1947-1963	*	*	*	*	*	*	-	*	*	*
1964	-	-	-	-	-	20	-	20	-	20
1965	*	*	*	*	*	*	-	*	*	*
1966	-	-	-	-	-	12	-	12	-	12
1967	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	2	-	2	-	
1970	-	-	-	-	-	8	-	8	-	
1971	-	-	-	-	-	20	-	20	-	
1972	-	-	-	-	-	17	-	17	-	17
1973	-	-	-	-	-	35	-	35	-	35
1974	-	-	-	-	-	2	-	2	-	2
1975	-	-	-	-	-	-	-	-	-	-
1976	-	-	-	-	-	9	-	9	-	9
1977	-	-	-	-	-	11	-	11	<1	11
1978	286	-	-	-	-	15	-	301	4	305
1979	424	90	-	-	-	1,292	-	1,806	13	1,819
1980	697	448	-	-	611	2,452	-	4,208	24	4,232
1981	1,173	657	-	-	720	4,371	-	6,921	47	6,968
1982	813	486	-	-	657	3,933	-	5,889	38	5,927
1983	1,073	435	-	-	816	4,582	-	6,906	29	6,935
1984	335	717	-	-	1,185	3,662	-	5,899	19 3/	5,918
1985	733	724	977	358	1,299	3,548	-	7,639	0	7,639
1986	751	557	886	511	1,865	5,194	-	9,764	0	9,764
1987	313	321	923	414	1,342	4,082	146	7,541	0	7,541

1/ Pre 1964 harvest primarily in summer and fall for food; post 1964 harvest primarily in spring for sac roe. Wastage included.

2/ Fishery occurred some years but harvest data unavailable.

3/ Additional 3 st harvested from imported kelp (Macrocystis sp) not included.

* No commercial operations reported.

Table 2. Estimated biomass and commercial harvest of Pacific herring in Northeastern Bering Sea fishing districts, Alaska, 1981 - 1987

	District	Estimated Biomass (st)	Harvest (st)			% Harvest by Gear			Roe %	Estimated Value ($ x1,000)	Exploitation Rate (%)
			Catch	Waste	Total	Gill Net	Purse Seine	Beach Seine			
1987											
	Security Cove	2,300	313	0	313	100	0	0	9.7	242	13.0
	Goodnews Bay	2,000	321	0	321	100	0	0	7.3	133	16.0
	Nelson Is.	8,100	923	0	923	100	0	0	9.2	661	11.4
	Nunivak Is.	4,400	414	0	414	100	0	0	7.8	231	9.2
	Cape Romanzof	7,200	1,342	0	1,342	100	0	0	8.9	1,000	18.6
	Norton Sound	32,400	4,082	0	4,082	92	0	8	8.6	2,613	12.6
	Port Clarence	900	146	>1	146	>1	100	0	6.6	77	15.6
	Total	57,300	7,541	>1	7,541	94	2	4	8.6	4,957	13.1
1986											
	Security Cove	3,700	751	0	751	100	0	0	11.2	535	20.3
	Goodnews Bay	3,000	557	0	557	100	0	0	10.4	325	18.1
	Nelson Is.	7,300	886	0	886	100	0	0	10.3	428	12.1
	Nunivak Is.	6,000	511	0	511	100	0	0	10.1	213	8.5
	Cape Romanzof	7,500	1,865	0	1,865	100	0	0	9.2	1,142	24.9
	Norton Sound	28,100	5,194	0	5,194	96	0	4	9.6	2,900	18.5
	Total	55,600	9,764	0	9,764	98	0	2	9.7	5,543	17.6
1985											
	Security Cove	4,900	703	30	733	100	0	0	10.1	355	15.0
	Goodnews Bay	4,300	724	0	724	100	0	0	8.7	309	16.8
	Nelson Is.	9,500	977	0	977	100	0	0	10.6	527	10.3
	Nunivak Is.	5,700	358	0	358	100	0	0	8.9	146	6.3
	Cape Romanzof	7,000	1,299	0	1,299	100	0	0	8.3	550	18.6
	Norton Sound	20,000	3,548	0	3,548	95	0	5	9.9	1,438	17.7
	Total	51,400	7,609	30	7,639	87	0	13%	9.6	3,325	14.8
1984											
	Security Cove	5,100	325	10	335	100	0	0	11.8	110	6.6
	Goodnews Bay	4,100	667	50	717	100	0	0	10.1	168	17.5
	Cape Romanzof	6,100	1,185	0	1,185	100	0	0	8.6	306	19.4
	Norton Sound	23,100	3,572	90	3,662	91	0	9	10.3	888	15.9
	Total	38,400	5,749	150	5,899	95	0	5	10.0	1,472	15.4
1983											
	Security Cove	6,400	1,073	0	1,073	100	0	0	9.4	443	16.8
	Goodnews Bay	3,200	435	0	435	100	0	0	9.4	185	13.6
	Cape Romanzof	5,500	816	0	816	100	0	0	9.0	367	14.8
	Norton Sound	28,100	4,582	0	4,582	100	0	<1	8.6	1,519	16.3
	Total	43,200	6,906	0	6,906	100	0	<1	8.8	2,514	16.0
1982											
	Security Cove	5,100	813	0	813	100	0	0	9.3	271	15.9
	Goodnews Bay	2,600	486	0	486	100	0	0	9.5	188	18.7
	Cape Romanzof	4,900	657	0	657	100	0	0	9.3	222	13.4
	Norton Sound	17,400	3,933	0	3,933	100	0	0	8.8	1,046	22.6
	Total	30,000	5,889	0	5,889	100	0	0	9.0	1,727	19.6
1981											
	Security Cove	8,300	1,173	0	1,173	100	0	0	8.1	347	14.1
	Goodnews Bay	4,300	657	0	657	100	0	0	7.7	196	15.3
	Cape Romanzof	4,900	720	0	720	100	0	0	8.0	211	14.7
	Norton Sound	25,100	4,371	0	4,371	100	0	0	8.8	1,500	17.4
	Total	42,600	6,921	0	6,921	100	0	0	8.5	2,254	16.2

Table 3. Number of buyers and fishermen participating in Northeastern Bering Sea Pacific herring fisheries, Alaska, 1981 - 1987

District	Number of Buyers	Number of Fishermen		
		Gill Net	Seine	
			Purse	Beach
1987				
Security Cove	8	65	*	*
Goodnews Bay	4	117	*	*
Nelson Island	9	235	*	*
Nunivak Island	4	61	*	*
Cape Romanzof	9	157	*	*
Norton Sound	12	559	*	22
Port Clarence	2	1	3	*
1986				
Security Cove	11	88	*	*
Goodnews Bay	5	104	*	*
Nelson Island	4	163	*	*
Nunivak Island	5	36	*	*
Cape Romanzof	5	97	*	*
Norton Sound	10	319	*	4
1985				
Security Cove	6	107	*	*
Goodnews Bay	5	83	*	*
Nelson Island	6	143	*	*
Nunivak Island	5	37	*	*
Cape Romanzof	2	73	*	*
Norton Sound	11	274	*	4
1984				
Security Cove	4	38	*	*
Goodnews Bay	4	130	*	*
Cape Romanzof	3	66	*	*
Norton Sound	8	189	*	10
1983				
Security Cove	6	94	*	*
Goodnews Bay	4	84	*	*
Cape Romanzof	3	63	*	*
Norton Sound	9	271	*	1
1982				
Security Cove	3	107	*	*
Goodnews Bay	3	84	*	*
Cape Romanzof	2	75	*	*
Norton Sound	7	237	*	0
1981				
Security Cove	7	113	*	*
Goodnews Bay	5	175	*	*
Cape Romanzof	4	111	*	*
Norton Sound	13	332	*	0

* Gear Prohibited.

Table 4. Pacific herring subsistence harvest (st) and effort data from selected Northeastern Bering Sea areas, Alaska, 1975-1987.

Village	Year												
	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Nelson Island													
Tununak	22	15	57	38	34	65	40	48	94	-	43	63	48
Umkumiut	33	9	3	11	8	3	10	0	-	-	-	-	- 4/
Toksook Bay	34	35	21	37	51	29	14	35	-	-	46	70	51
Nightmute	-	-	-	-	-	-	-	-	-	-	3 2/	21	15
Newtok	-	-	-	-	-	-	-	-	-	-	7 2/	13	10
Total	89	59	81	86	93	97	64	83	94	-	99	167	124
Number of Fishing Families	109	42	90	83	54	70	93	65	43	-	65 2/	72 2/	96
Nunivak Island													
Mekoryuk	-	-	-	-	-	-	-	-	-	-	<1	<1	-
Number of Fishing Families	-	-	-	-	-	-	-	-	-	-	11	6 2/	-
Other Kuskokwim Delta													
Chefornak	-	-	-	-	-	-	-	-	-	-	13 2/	- 3/	14
Kipnuk	-	-	-	-	-	-	-	-	-	-	9	- 3/	14
Kongiganak	-	-	-	-	-	-	-	-	-	-	3	2 2/	3/
Kwigillingok	-	11	1	-	8	13	-	13	-	-	5	- 3/	3/
Total	-	11	1	-	8	13	-	13	-	-	30	2	28
Number of Fishing Families	-	8	9	-	22	19	-	21	-	-	55 2/	12 2/	49
Yukon Delta													
Scammon Bay	-	1	-	1	6	3	8	4	3	4	2	2	>1
Chevak	-	1	<1	-	2	4	2	2	1	3	2	1	<1
Hooper Bay	3	3	2	4	3	4	4	5	5	4	4	4	>1
Total	3	5	<3	5	11	11	14	11	9	11	8	7	3
Number of Fishing Families	34	41	30	29	84	61	46	43	37	47	44	41	39
Areas Combined													
Total Catch	92	75	85	91	112	121	78	107	103	11	138	177	155
Number of Fishing Families	143	91	129	112	160	150	139	89	80	47	175 2/	131	184

1/ Subsistence survey results are believed to accurately reflect harvest trends, however, reported catches reflect minimum figures since all fishermen cannot be contacted.

2/ Fishing families were not interviewed or only a portion of fishing families were interviewed as catch was enumerated while on drying racks.

3/ Survey not allowed by village council.

4/ Umkumiut effort included with Tununak.

- Not surveyed.

Table 5. Pacific herring commercial fishing period summary of Northeastern Bering Sea fishing districts, Alaska, 1987.

District	Subdistrict Section/Area	Gear 1/	Period	Date	Time	Total hours	(st) Harvest
Security Cove	Entire	GN	1	5/2	0600-1200	6	0
			2	5/10	0600-0900	3	1.6
			3	5/14	1830-2230	4	311.8
						13	313.4
Goodnews Bay	Entire	GN	1	5/3	0800-1400	6	33.5
			2	5/7	1500-2000	5	287.3
						11	320.8
Nelson Island	Entire	GN	1	5/23	1700-2000	3	238.4
			2	5/24	1900-2200	3	684.9
						6	923.3
Nunivak Island	Entire	GN	1	5/13	2000-2200	2	49.9
			2	5/21	1300-1700	4	0
			3	5/22	1300-1700	4	1.8
			4	5/23	1400-1900	5	18.3
			5	5/24	1400-0800	18	220.5
			6	5/25	1900-2200	3	87.0
			7	5/26	2000-2300	3	36.5
						39	414.0
Cape Romanzof	Entire	GN	1	5/23	0800-1100	3	558.7
			2	5/26	2000-2300	3	401.2
			3	5/27	1300-1500	2	381.7
						8	1341.6
Port Clarence	Entire	GN	1/				.7
	Entire	PS	2/				145.5
							146.2
Norton Sound	SD 1, 2, 3	GN	1	6/7	0600-1200	6	2996
			2	6/7	2100-2200	1	731
						7	3727
	SD 1, 2, 3	BS	1	6/7	1400-1700	3	196
	SD 2, 3		2	6/8	1400-1600	2	159
						5	355

1/ Fishery was opened to gillnet by regulation on 4/15 and closed on 6/19 and reopened on 6/21. The fishery will close by regulation 11/15.

2/ Opened by regulation on 4/15. Purse seiners restricted to four 2 hour periods per day from 6/14 - 6/19. Closed on 6/19; reopened on 6/21. No buyers after 6/19.

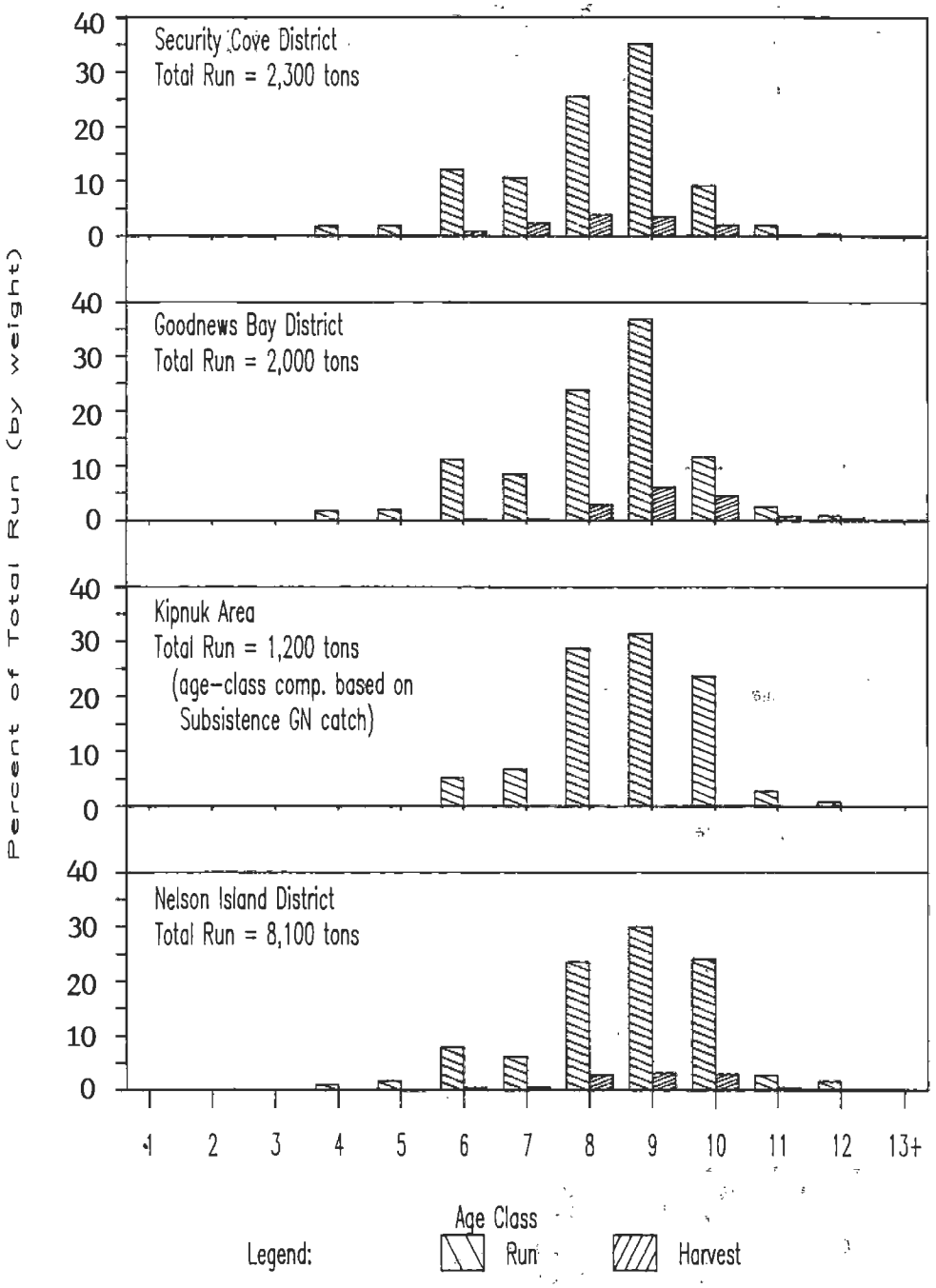

Figure 4. Age composition of Pacific herring in spawning populations and commercial harvests in Nunivak Island, Cape Romanzof, Norton Sound, and Port Clarence commercial herring fishing districts in the northeastern Bering Sea, Alaska, 1987. (CPS - commercial purse seine).